THE NUCLEAR BOMBER FORCE IN THE 21ST CENTURY

Graduate Research Paper

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Abstract

Rapid growth in technology has allowed U.S. adversaries to develop robust air defense systems, creating contested areas that limit the ability of the United States to gain and maintain air superiority. These new defenses have created a difficult tactical problem for the both the U.S. conventional and strategic nuclear forces to solve. Not only does the bomber force have to contend with robust advanced integrated defenses, the fleet's age is becoming a concern. The United States Air Force has 158 bombers in its inventory. Currently, both the B-1B and the B-52H will remain in service until 2045. Age and threat capabilities are driving the Department of Defense to pursue a replacement for the B-1Bs and B-52Hs. The goal of this research is to analyze the acquisition of 100 B-21 stealth bombers, determine the right size and composition of the U.S. bomber force and investigate the impact the acquisition of a new stealth bomber will have on future nuclear arms treaties.

To my wife and children, thank you for your support and encouragement

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I. Introduction

"Let us, therefore, beware of being lulled into a dangerous security. . . . The expenses required to prevent a war, are much lighter than those that will, if not prevented, be absolutely necessary to maintain it."

-Benjamin Franklin, 13 May 1784

Background

The 21st century adversary is presenting challenges to the United States (U.S.) unlike anything the U.S. has previously encountered. Since World War II, the U.S. has maintained a monopoly on air superiority and has been able to project airpower anytime anywhere on the globe. Present day adversaries are challenging the ability of the U.S. to project airpower. Rapid growth in technology has allowed U.S. adversaries to develop robust integrated air defense systems (IADS). These improved IADS, deployed on adversarial borders, have created a contested area in which penetration is extremely challenging. Known as Anti-Access/Area Denial (A2/AD), these new defenses have created a difficult tactical problem for the both the U.S. conventional and strategic nuclear forces to solve. Not only does the bomber force have to contend with robust advanced integrated defenses, the fleet's age is becoming a concern. The United States Air Force (USAF) currently has 158 bombers in its inventory. The bomber fleet consists of 75 B-52s (average age: 53 years), 63 B-1Bs (average age: 28 years), and 20 B-2s (average age: 20 years) (Moeller, 2015: 3). Currently, both the B-1B and the B-52H will remain in service until 2045. By 2025 the average age for the bomber fleet will be approximately 50 years old (Moeller, 2015: 4). The aging aircraft, while updated to combat current threats, face future challenges presented by the combination of age and

the increasing capabilities of the adversary's IADS. Age and threat capabilities are driving the Department of Defense to pursue a replacement for the B-1Bs and B-52Hs.

Since the end of the Cold War the Department of Defense (DoD) has analyzed the status of U.S. forces. In 1992 the Government Accounting Office (GAO) released a Bomber Roadmap. The GAO report called for 211 bombers yielding 166 combat-coded airplanes (Moeller, 2015: 8). Following the GAO's 1992 report the Office of the Secretary of Defense (OSD) released the 1993 Bottom-Up Review (BUR). The Bottom-Up Review calculated that the U.S. needed just 100 combat-coded bombers modernized with precision weapons to support one theater conflict (DoD, 1993: 19). Just two years later the RAND Corporation released an analysis concluding the number of bombers required to maintain nuclear deterrence and support operations in one theater conflict could triple to 300 aircraft (Moeller, 2015: 9). In 1999 the Air Force released a white paper on long-range bombers. The white paper, based on the nation's current strategy, stated the need for 190 total bombers to yield 130 combat-coded aircraft. Two years later the Air Force updated the 1999 white paper, this time reducing the total number of bombers to 157 with just 96 combat-coded airplanes. Today, the Air Force maintains a bomber force of 158 aircraft. Of the 158 aircraft, 96 of the bombers are "combat-coded," the remaining 62 bombers are dedicated test and training aircraft or are in depot maintenance. Furthermore, of the 158 bombers the 63 B-1Bs are equipped only for conventional munitions and the 20 B-2s are the only stealth bombers in the inventory. The USAF is actively pursuing the B-21, another long-range stealth bomber, to add to the inventory. It will replace the aging B-1B and B-52H aircraft and improve the bomber force stealth capability. "If the fledgling programs now requested are killed or further

delayed, the U.S. nuclear arsenal, will be further disarmed by neglect" (Payne, 2015: 63). The U.S. must take action by purchasing the B-21, a costly peacetime action, which will bolster their credibility within their alliances (Fuhrmann, 2014: 923). Assuming the DoD purchases 100 B-21 aircraft, what is the proper make-up and total bomber fleet size for the future and how will the purchase of the new aircraft impact future nuclear policy?

Problem Statement

The USAF is going to purchase 100 B-21 long range strike bombers in order to provide "critical operational flexibility across a wide range of military operations providing both conventional and nuclear capability in fulfillment of national objectives" (USAF Communication Waypoints, 2016). The Air Force desires a procurement cost of $511 million per aircraft in fiscal year 2010 dollars and "in an effort to achieve the $511 million cost target, unit cost was designated as a key performance parameter in the acquisition strategy" (Gertler, 2016: 9). Unfortunately, the current fiscal constraints and the global security environment are presenting challenges to the requirement for a new bomber. The U.S. is currently attempting to modernize all three legs of the strategic nuclear forces, spending nearly $1 trillion dollars over the next 30 years. By declaring the unit cost a key performance parameter, the Air Force has levied a contract requirement that must be met in order for the acquisition product to be considered a success. Additionally, declaring the unit cost as a key performance parameter will keep the B-21 acquisition within planned budget constraints. Moreover, U.S. adversaries are actively procuring and developing new technologies to bolster their integrated air defense systems, in an attempt to deny the United States the ability to project air power. The acquisition of the B-21 will impact the size and composition of the bomber force, current

and future nuclear arms treaties, and the execution of both conventional and nuclear operations. Therefore, the proposed research is targeting the size and composition of the bomber force.

Purpose Statement

The United States Air Force currently has 158 bombers, a mix between B-1, B-2, and B-52 aircraft. Of those only the 20 B-2s are stealth aircraft and only the B-2 and B-52 are tasked with the nuclear mission. The goal of this research is to analyze the acquisition of 100 B-21 stealth bombers, determine the right size and composition of the U.S. bomber force and determine the impact the acquisition of a new stealth bomber will have on future nuclear arms treaties.

Research Objectives/Investigative Questions

The focus of this research will be on the acquisition of the B-21 long range strike bomber. The research will specifically address the impact 100 of the new bombers will have on the size and composition of the current bomber fleet and the bearing the new bombers will have on current and future nuclear arms treaties. The goal of this research is to provide courses of action for Air Force leaders to take as decisions are being made concerning the future of the nuclear strategic forces. This paper seeks to answer one primary research question by addressing three investigative questions (IQ):

RESEARCH QUESTION: How will the acquisition of 100 B-21 stealth bombers redefine the size and composition of the U.S. bomber force?

IQ1: How do the decisions the Department of Defense make today, concerning the status of US nuclear bomber forces, impact US nuclear deterrence in the future?

IQ2: What is the impact of the purchase of 100 B-21 aircraft on the composition and fleet size of bomber aircraft?

IQ3: How will treaty constraints impact the size and composition of the bomber force?

Scope

The research will focus on the analysis the USAF used to determine the current bomber fleet size and composition. Additionally, the research will look at the proposed number of B-21 bombers being acquired and their impact on the ability for the bomber force to execute the nuclear mission. Finally, the research will examine current nuclear arms reduction treaty requirements and how the addition of bomber aircraft will be impacted.

Assumptions/Limitations

There are four major assumptions for this research. The first assumption is, the USAF has determined that 100 B-21 aircraft is the right number of bombers to purchase and the DoD will purchase all 100 aircraft. The second major assumption is, the 100 B-21 long range strike bombers will replace the B-1B and the B-52H. The third assumption is that the B-21 will be an optionally manned aircraft, requiring one mission commander and one pilot to execute both manned and unmanned missions. Additionally, while flying manned missions the mission commander and pilot will both be qualified pilots and while flying unmanned missions the mission commander and pilot can be either a qualified pilot or a qualified remotely piloted aircraft (RPA) pilot. The final assumption this research makes is that the B-1B and B-52H will remain in service until 2045 and at that time all 100 B-21 aircraft will be in service.

Currently there is only one significant limitation to this research. The B-21 program is classified at the Special Access Program level. Gathering specific data about the aircraft, projected manning, projected basing decisions and infrastructure will be challenging. While the program is highly classified, this research will remain unclassified and use only unclassified sources.

Implications

This research will help the DoD and senior Air Force leaders compare various courses of action as the B-21 enters the strategic bomber force. In addition, the findings of this research will inform senior leaders of the potential limitations imposed by current strategic nuclear treaties and will help shape the discussions concerning changes that may or may not need to be made for future treaties.

The next four chapters will provide the basis for the suggested courses of action. Chapter two will provide a literature review of the applicable research used for this paper. There will be a discussion on nuclear policy and the impact it has on the strategic nuclear forces. Additionally, there will be discussions on the current bomber force structure and the B-21. The third chapter will provide an overview of the methodology used for this research paper and chapter four will discuss the analysis and results of the research. The final chapter will offer a summary of the research, implications, and recommendations for action and for future research.

II. Literature Review

"We want to prevent war by deterring others from the aggression that causes war. If our efforts are successful, we will have peace and never be forced into battle. There will never be a need to fire a single shot. That's the paradox of deterrence."

–President Ronald Reagan

In the pre-dawn hours of 6 August 1945, Colonel Paul W. Tibbets Jr. taxied his Boeing B-29 Superfortress to the runway on a remote island in the Pacific Ocean. The commander of the 509th Composite Group charged with the nation's most vital mission pushed up the throttles of the Enola Gay, Colonel Tibbets' aircraft famously named for his mother. 2,000 miles and six hours after take-off the crew of the Enola Gay reached their intended destination. The crew employed the newest weapon in the United States inventory, at 08:16 Little Boy, the first atomic bomb released in anger, detonated over Aioi Bridge in Hiroshima, Japan (Reed, 2010: 23). Reeling from the devastation caused by the United States' new technology, Japan struggled to comprehend exactly what occurred and did not yield to United States. Three days later the United States launched a second strike on mainland Japan. This time led by Major Charles W. Sweeney piloting Bock's Car, a 509th Composite Group B-29 carrying Fat Man, the second atomic weapon to be employed in anger. At 11:02 am on the morning of 9 August 1945 Fat Man detonated over Nagasaki, Japan. The next day the Emperor of Japan met with his cabinet to discuss how to proceed (Reed, 2010: 23). On 15 August 1945, the Emperor of Japan announced his intention to end Japanese hostilities, thus exiting from the Second World War (Reed, 2010: 23).

The sleeping giant's new technology changed policy, diplomacy, and how nation's wage wars. The United States' use of the atomic bomb ushered in the concept of deterrence to the political arena, forever changing the world. Although there is no reason to treat

nuclear weapons any differently than conventional weapons, there is a symbolic difference that cannot be denied (Schelling, 1996: 135).

Deterrence theory is the backbone of the U.S. strategic nuclear forces. It provides the logic and reasoning for the United States' employment of the three legs of the triad (ICBMs, SLBMs, and bombers). Each president develops a strategy, rooted in deterrence theory, to deter U.S. adversaries and to assure U.S. allies. The strategy developed, is put into action through presidential directives or policy changes. Ultimately, the size and composition of the bomber force is determined by policy that was crafted to meet the president's deterrence strategy. Currently there are 158 bomber aircraft employed by the U.S. in defense of the nation. 158 is not an arbitrary number, in fact, in the early 1990s several reports were commissioned to determine what the correct number of aircraft was needed to ensure the nation's security. The size and composition of the current bomber fleet was determined by actions taken at the end of the Cold War, when many in the U.S. no longer viewed the Russians as a nuclear threat.

U.S. Nuclear Policy

The invention and employment of the atomic bomb in 1945 changed the political landscape across the world. The sheer power, speed, and indiscriminant lethality of nuclear weapons causes chaos, pain, shock, and devastation. Nations have no choice but to factor the use of nuclear weapons into deterrence policy. National governments deter opponents with the full range of diplomatic, informational, military, and economic policy tools (McMahon). Current United States nuclear policy is a product of the evolution in deterrence thought spanning twelve presidents over the last seventy-one years. A newly elected administration will undoubtedly usher in new changes to nuclear policy and could

possibly direct changes to the structure of the strategic nuclear forces. Nuclear policy has evolved over time with each president, from President Harry Truman's policy of "Appropriate Response" to President Barack Obama's "Concrete Steps to a Nuclear Free World." The following section examines the United States progression of nuclear policy, which impacted the current bomber force structure. Policymaking is a complex process that is not easy to navigate. The process was made even more challenging with the introduction of nuclear weapons in 1945.

Civilian control of nuclear weapons was established by the Atomic Energy Acts passed by Congress in 1946 and 1954. These acts placed the control of nuclear energy production and materials into the hands of the civilian government instead of the U.S. military. 33 years later, in 1987, Congress created the Nuclear Weapons Council, the highest decision-making body for nuclear weapons issues (Rardon, 2011: 12). Ultimately, the size and structure of the U.S. strategic nuclear forces is dictated by the legislation and policies passed by civilian lawmakers. Since the end of the Cold War the United States has reduced their nuclear forces. For many civilians when there is not a direct threat against the U.S., especially the threat of nuclear attack, the popular view is to employ a reduction strategy (Rardon, 2011: 5). "The risk of losing a job or being denied healthcare is much greater than a nuclear attack, but the costs of a nuclear conflict far exceed any other event" (Rardon, 2011:5). Generally speaking, as long as nuclear forces are safe and effective most civilians do not think about nuclear weapons or the nuclear forces that employ them. Since the fall of the Soviet Union in 1991, the United States' nuclear forces have been in decline. After a series of missteps, most notably the unauthorized transfer of nuclear missiles from Minot AFB to Barksdale AFB in 2007, the

Department of Defense has sought to re-invigorate the nuclear enterprise.

President Ronald Reagan: Prevailing

At the height of the Cold War Ronald Reagan was elected into office. He brought with him new thoughts on how to defeat the Soviet Union and ultimately would alter President Carter's countervailing nuclear strategy to one known as prevailing. He issued National Security Decision Directive 13 (NSDD) in 1981. NSDD-13 outlined the prevailing nuclear policy. President Reagan's prevailing strategy was simple, subtle refinements would be made to his predecessor's strategy, with the basic assumption the United States would "prevail" in a nuclear war with the Soviet Union (Air Force Nuclear Weapons Center: 30). Although President Reagan was a harsh critic of Carter's decision to agree to the terms outlined in SALT II, he agreed to honor former President Carter's commitment to the Soviet Union until the treaty expired at the end of 1985. While keeping former commitments, President Reagan's prevailing strategy called for increased defense spending, the employment of the Strategic Defense Initiative (SDI, commonly referred to as Star Wars), move away from mutually assured destruction, and specific rejection of the belief that deterrence must rest on the threat to destroy a high percentage of the Soviet population (Air Force Nuclear Weapons Center: 30). Additionally, President Reagan's strategy shifted to a more selective, discriminate, and controlled response to nuclear deterrence (Air Force Nuclear Weapons Center: 30). The decision not to target Soviet population was the most significant change to nuclear policy. Although Reagan adopted a newer strategy, one relying on advancement in technology, there was still quite an increase in the number of nuclear warheads employed by roughly the same number of strategic nuclear forces. Figure 1 shows that since the 1960s the

United States strategic nuclear stockpile continually increased, peaking in 1987 around 13,600 warheads (Woolf, 2015: 3).

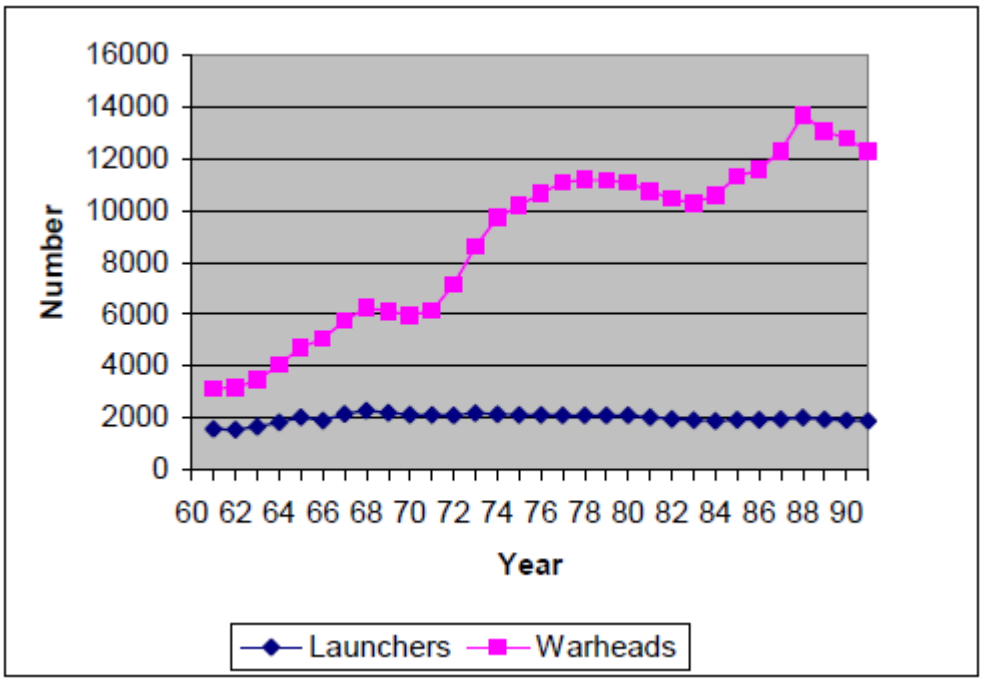

Figure 1: U.S. Strategic Nuclear Weapons: 1960 – 1990 (Woolf, 2015)

Even though the United States was modernizing all of its nuclear forces, President Reagan sought an end to the massive build-up of nuclear weapons. His efforts to reduce the number of nuclear warheads and strategic nuclear forces began in May of 1982, when President Reagan began to pursue the Strategic Arms Reduction Treaty (START). Although he sought limits on nuclear weapons, he maintained that peace would be achieved through strength. Throughout President Reagan's tenure the United States increased defense spending. The products of the increased spending were the development and acquisition of the B-1 Lancer, B-2 Spirit bombers and the Trident II D-5 Submarine Launched Ballistic Missile (SLBM). The Soviet Union saw the United States modernization efforts and tried to match the U.S. Unfortunately for the Soviet

Union their economy was unable to support massive amount of money the government was spending to keep up with the United States. In 1989 the Berlin Wall fell signaling the beginning of the end for the once mighty Soviet Union and an end to the Cold War.

President George H. W. Bush: Disarmament-Post Cold War

President George H. W. Bush was Reagan's right hand man through the 1980s. He was there to help craft Reagan's nuclear policy and there to help end the Cold War. The Berlin Wall fell in 1989 thanks in large part to the previous administration's policies. In July 1991 after ten years of negotiations, the United States and the Soviet Union finally reached an agreement with the Strategic Arms Reduction Treaty. The treaty was the largest and most complex arms control treaty in history, aimed at significantly reducing both the United States' and Soviet Union's nuclear weapons stockpile (Air Force Nuclear Weapons Center: 32). START limited the number of strategic nuclear delivery vehicles to a total of 1,600. It did not take long for the United States to begin reducing its forces. President Bush enacted two significant Presidential Nuclear Initiatives (PNI). In September of 1991, President Bush announced PNI 1. PNI 1 "removed strategic bombers and ICBMs from alert, 450 Minuteman II silos were stood down, all deployed ground-launched short range nuclear forces were recalled and slated for retirement and elimination, nonstrategic nuclear weapons were ordered removed from deployment on Navy ships and submarines, and the development programs for mobile ICBMs, small ICBMs, and SRAM II missiles were canceled" (Kunsman, 2001: 64) Just three months after announcing the first wave of nuclear disarmament, President Bush enacted PNI 2. PNI 2 signaled the end to the production of new warheads for the Trident missile, the procurement of the B-2 was terminated, the Advanced Cruise Missile (ACM)

build was shortened, and the production of the Peacekeeper missile was stopped (Kunsman, 2001: 64). The decision to halt the procurement of the B-2 was significant. Unlike the B-21, the B-2 was not intended to replace the both the B-1 and the B-52, but to bring a stealth capability to the bomber force. It was developed as a penetrating bomber with low observable technology that would make it difficult for adversary radars to track the aircraft. "Arguably, that role as an enhancement rather than a replacement made it easier to reduce the number of aircraft bought" (Gertler, 2016: 8). Before President Bush decided to end the B-2 procurement, the U.S. was going to purchase 132 aircraft, but because of his decision only 21 B-2 stealth aircraft were acquired.

After PNI 2 was implemented a study was conducted by the Air Force on the structure of the bomber force. *The Bomber Roadmap: Enhancing the Nation's Conventional Bomber Force* was released in June 1992. The report was commissioned in order to develop a plan to convert a large bomber force focused on the nuclear mission to a smaller, "more sophisticated force equipped to perform a variety of conventional missions" (Department of the Air Force, 1992, 1). "The Roadmap lays out a careful, fiscally prudent plan to capitalize on the global reach inherent in the bomber force. It focuses on enhancing survivability, weapons carriage, and flexibility to match the demands of decreased overseas presence, declining defense budgets, and continuing American interests overseas" (Department of the Air Force, 1992, 1). The Air Force was facing a shrinking budget and needed to set clear priorities in order to compensate for the unanticipated decrease in the number of B-2 aircraft that were acquired. The report also marks a definitive shift in mind set, shifting from a primarily nuclear focus to a conventional focus.

In order to develop the future bomber force structure, the Air Force developed a metric revolving around *Priority Target Coverage* as shown in figure 2.

They used the Desert Storm experience as an example for future requirements and identified a hypothetical list of 238 initial, high priority targets that a theater CINC might have to destroy within the first five days-to unhinge an enemy's strategic plan, stall his offensive and pave the way for joint forces arriving in theater. The list divided into 1250+ individual target elements. Figure 2 shows their performance projection of the 1992 bomber force of B-52s and B-1s under wartime conditions, assuming a 0.4 sortie rate from the United States (with a 75% mission capable rate added on) and a standard crew ratio. Under those conditions, in 1992 the B-52s and B-1s could destroy at best about 300 or 24% of the 1250+ target elements. That falls short by 76%, because the bomber force of B-52s and B-1s in 1992 was limited in precision conventional weapons capability, robust anti-armor capability, and flexible employment options. (Depart of the Air Force, 1992, 3).

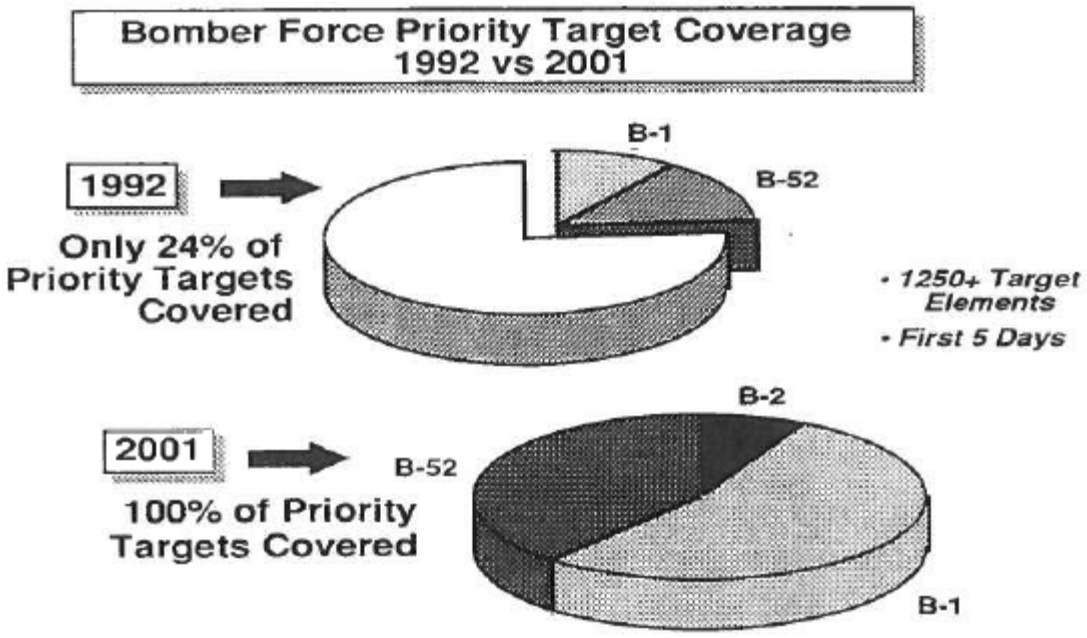

Figure 2: Bomber Force Priority Target Coverage (Air Force, 1992)

With the conventional requirement seeking, 100% target coverage for 1250+ targets, there was a need to determine the composition of the future bomber force to ensure both the conventional requirements and nuclear deterrence mission could be executed. An analysis was conducted and the decision was made to decrease the bomber force to just 211 aircraft. The 211 aircraft would be comprised of 96 B-1Bs, 20 B-2s, and 95 B-52Hs (Department of the Air Force, 1992, 5). In order to operate at such a low number of aircraft the Air Force noted that the bombers would require the capability to employ advanced munitions. The conscious decision to reduce the number of bombers in the fleet and invest in advanced technology (creating a smaller but more lethal force) was a driving factor for the current bomber force size and composition. President Bush took great strides in reducing the United States nuclear forces, and his successor carried on the post-Cold War disarmament.

President Bill Clinton: Lead but Hedge

On January 3 1993, President Bush and Russian President Boris Yeltsin signed the second Strategic Arms Reduction Treaty. The end goal of START II was for both the United States and Russia to reduce the total number of nuclear weapons by two-thirds below the pre-START levels. Seventeen days after this agreement, newly elected Bill Clinton assumed the presidency of the United States. The reduction of strategic nuclear forces was inevitable and it needed to be handled smartly so not to jeopardize U.S. national security.

In March 1993, Secretary of Defense Les Aspin commissioned the Bottom-Up Review. The Bottom-Up Review was the first major review of the nation's defense strategy, force structure, modernization, infrastructure, and foundations post-Cold War. In order to address international threats, the Bottom-Up Review based the future conventional forces structure on the ability "to achieve decisive victory in two nearly simultaneous major regional conflicts and to conduct combat operations characterized by rapid response and a high probability of success, while minimizing the risk of significant American casualties" (DoD, 1993: 8). The report determined that "fielding forces sufficient to win two wars nearly simultaneously provides a hedge against the possibility that a future adversary, or coalition of adversaries, might one day confront the United States with a larger than expected threat" (DoD, 1993: 19). In order to ensure long-range bombers played a significant role on the conventional side of the house, supporting two major regional conflicts, it was decided to modify all three bombers: the B-1B, B-2 and B-52H to improve their ability to employ smart munitions and plan to develop all-weather munitions (DoD, 1993: 21). Additionally, the Bottom-Up Review added two

additional guidelines for future nuclear forces: “provide an effective deterrent while remaining within START I and II limits, and allow for additional forces to be reconstituted in the event of a threatening reversal of events” (DoD, 1993: 26). The anticipated overall force structure by 1999, as determined by the Bottom-Up Review, included 184 bombers (70 B-1B, 20 B-2, 94 B-52H).

Shortly after Secretary Aspen’s report was released in 1993, Glenn Buchan and David Frelinger released a separate study through the RAND Corporation. Buchan and Frelinger’s study analyzed what bomber force structure would be the most effective in the future. They found two options that would provide the most effective force to conduct combat operations in two nearly simultaneous major regional conflicts, a B-2 heavy force and a B-2 small force. “The two bomber forces are roughly the same size approximately 100 to 120 aircraft” (Buchan, 1994: 21). The first bomber force would consist of roughly 60 B-2s and 40 B-52H long-range cruise missile carriers (Buchan, 1994: 21). The second force would consist of less than 20 B-2s, 60 B-1Bs, and 40 B-52Hs (Buchan, 1994: 21). Both proposed bomber force structures are based on anticipated improved aircraft and weapon capabilities. Additionally, three problems were anticipated with the future bomber force; providing adequate crew ratios, sufficient repair and maintenance capability for sustained bomber operations, and adequate training/flight time (Buchan, 1994: 28). They found that the Bottom-Up Review’s proposed bomber force would be adequate to meet the demands of two simultaneous major regional conflicts, with the condition that the proposed improvements were made to the aircraft and munitions.

A year later in 1994 the White House completed its Nuclear Posture Review. The

NPR determined both nuclear weapons and the triad were extremely important to the survival of the United States as a deterrent to its adversaries. The NPR noted nuclear weapons played a smaller role in United States security and the United States no longer required a large nuclear arsenal (Air Force Nuclear Weapons Center: 35). Additionally, the NPR stated the need for the U.S. to maintain the nuclear triad, the capability to deploy a larger nuclear force, and to "maintain stockpile capabilities without testing, new design production, or producing new fissile material" (Air Force Nuclear Weapons Center: 35) Furthermore, the NPR found the limitations imposed by START II did not impact the ability of the United States to provide a credible deterrent and the U.S. should maintain a reconstitution capability for the strategic stockpile (Kunsman, 2001: 67). The Clinton administration continued the post-Cold War disarmament started during the previous administration. President Clinton's nuclear policy was focused on the continual reduction of nuclear weapons and the prevention of nuclear weapon proliferation, while maintaining a strategic nuclear deterrent force that hedged against adverse geopolitical developments (Air Force Nuclear Weapons Center: 34). Congress ratified START II in January 1996 and the Russian Duma and Federation Council approved the treaty four years later. During the remainder of President Clinton's term, the United States led the world in the reduction of nuclear weapons and non-proliferation.

The draw down in forces post-Cold War greatly impacted the current bomber force structure. In September 1996 the National Security and International Affairs Division submitted a report to the Government Accountability Office (GAO). The report acknowledged that since 1989, the United States had reduced the total number of bombers from 360 to 202, with a plan to further reduce the inventory to 187 (GAO, 1996:

2). The study argues that the GAO did not make a compelling argument to retain and upgrade the planned 187 bombers, leaving the door open for further reductions in the bomber force. Between 1996 and 2001 the Department of Defense had an estimated $17 billion budgeted for upgrade. The GAO study argued that cost savings could be found if B-2 production was capped at 21 aircraft, saving $27 billon over 25 years and retiring the B-1B fleet (since the aircraft no longer conducted the nuclear mission) could save $5.9 billion between 1997-2001 (GAO, 1996: 12). Additionally, it argued that "the B-52H requires the least amount of funding to upgrade its conventional capabilities and is and will continue to be the most versatile bomber in the fleet" (GAO, 1996:26). Furthermore, the report acknowledged that the Air Force could not "meet its war-fighting requirement to support a full complement of B-1B and B-52H bombers allocated to war-fighting CINCS because of personnel shortages" (GAO, 1996: 49). The report concluded that the Air Force could retire the B-1B fleet, further reducing the number of bombers to 92, 71 B-52s and 21 B-2s (GAO, 1996: 73).

Three years later in March of 1999 the Air Force released a "White Paper" on long range bombers. The white paper echoed several of the points made by previous reports. Most notably it continued the quest to seek advances in both aircraft and munition capabilities. It argued that in order for the Air Force to operate a smaller fleet, the fleet would require advanced munitions to maintain its lethality. Additionally, the report acknowledged the 1993 Bottom-Up Review's requirement of 184 combat coded bombers, but concluded:

"details of the strategy and resultant defense program in the May 1997 Report of the Quadrennial Defense Review (QDR), prescribe a total fleet of 187 bombers (95 B-1B,

21 B-2, and 71 B-52H). However, the existing bomber fleet cannot be sustained through the expected life of the air frames and additional aircraft will be required. To address this issue, the Air Force will add five additional B-52 attrition reserve aircraft, bringing the total from 71 to 76 for a total bomber force of 190" (USAF, 1999: 2). Figure 3 depicts the composition of the combat coded bomber force.

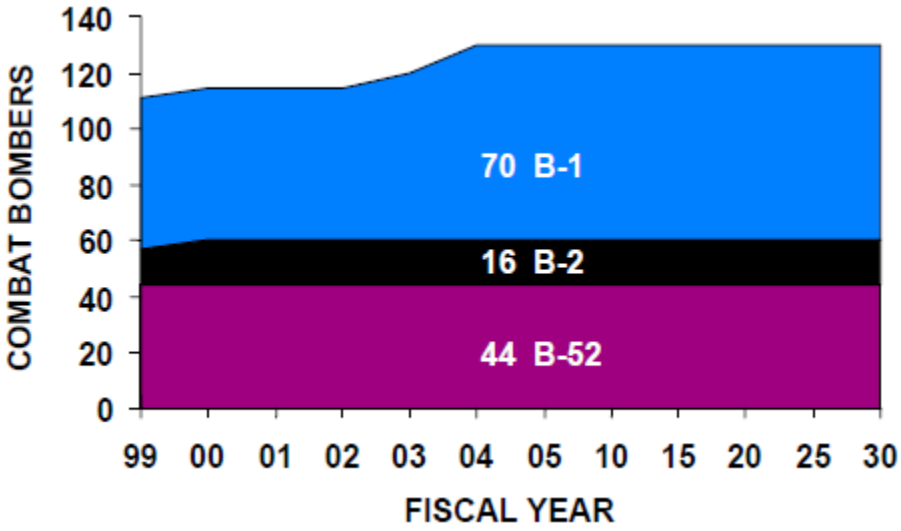

Figure 3: Bomber Combat Coded Force Structure (USAF, 1999)

"From the total number of 190 programmed bombers, 130 would be combat-coded aircraft, 24 were for training, 14 were attrition reserve, 2 for test, and 20 are backup" (USAF, 1999: 2). Based on the plan for future upgrades to both the aircraft and their munitions, the report maintained that bomber force could still execute the missions required to win nearly two simultaneous major theater wars.

While reducing the nuclear forces, the Clinton administration's 1999 National Security Strategy acknowledged the importance of a U.S. advantage concerning nuclear weapons. "Nuclear weapons serve as a guarantee of our security commitments to allies and a disincentive to those who would contemplate developing or otherwise acquiring

their own nuclear weapons. The United States will continue to maintain a robust triad of strategic nuclear forces sufficient to deter any potential adversaries" (Kunsman, 2001: 68).

President George W. Bush: The New Triad

Nuclear policy took a turn in 2001. On January 20, 2001 President George W. Bush took control of the White House. He inherited aging nuclear forces and nuclear policies aimed at the reduction of nuclear weapons. Nine months after entering office, Islamic terrorists from al-Qaeda executed four simultaneous attacks on the United States. The attacks killed thousands of American citizens, initiating a war we are still fighting today. The attacks forced the administration to re-examine previous nuclear policies still in effect.

Prior to the release of the 2001 NPR, the Air Force released a second white paper on long range bombers. This report continued to seek funding for advancements in modernization, but changed the requirement for the total number of bombers. The Air Force was no longer advocating for 190 aircraft, but for 157 bombers of which 96 would be combat coded. Figure 4 is an excerpt from the 2001 white paper, showing the planned bomber force.

Aircraft	Combat	Training	Test	BAI / AR	Total
B-1	36	16	4	4	60
B-2	16	0	1	4	21
B-52	44	12	2	18	76
Totals	**96**	**28**	**7**	**26**	**157**

Figure 4: Planned Total Bomber Force (USAF, 2001)

The bomber fleet would be considerably smaller and that would incur some

additional risk. However, the Air Force argued that "the risk will be mitigated by modernizing the remaining aircraft-our new long-range strike force will be more effective, more survivable, and more supportable" (USAF, 2001: 2). The 1999 white paper listed fleet age as a primary concern for the increased number of bombers in their assessment. As shown in Figure 5, this new white paper concluded that fleet age was no longer a factor, that all of the aircraft would be able to fly another four or five decades. With fleet age no longer a concern and modernization efforts underway, the decision was made to pursue the smaller, 157 aircraft bomber force.

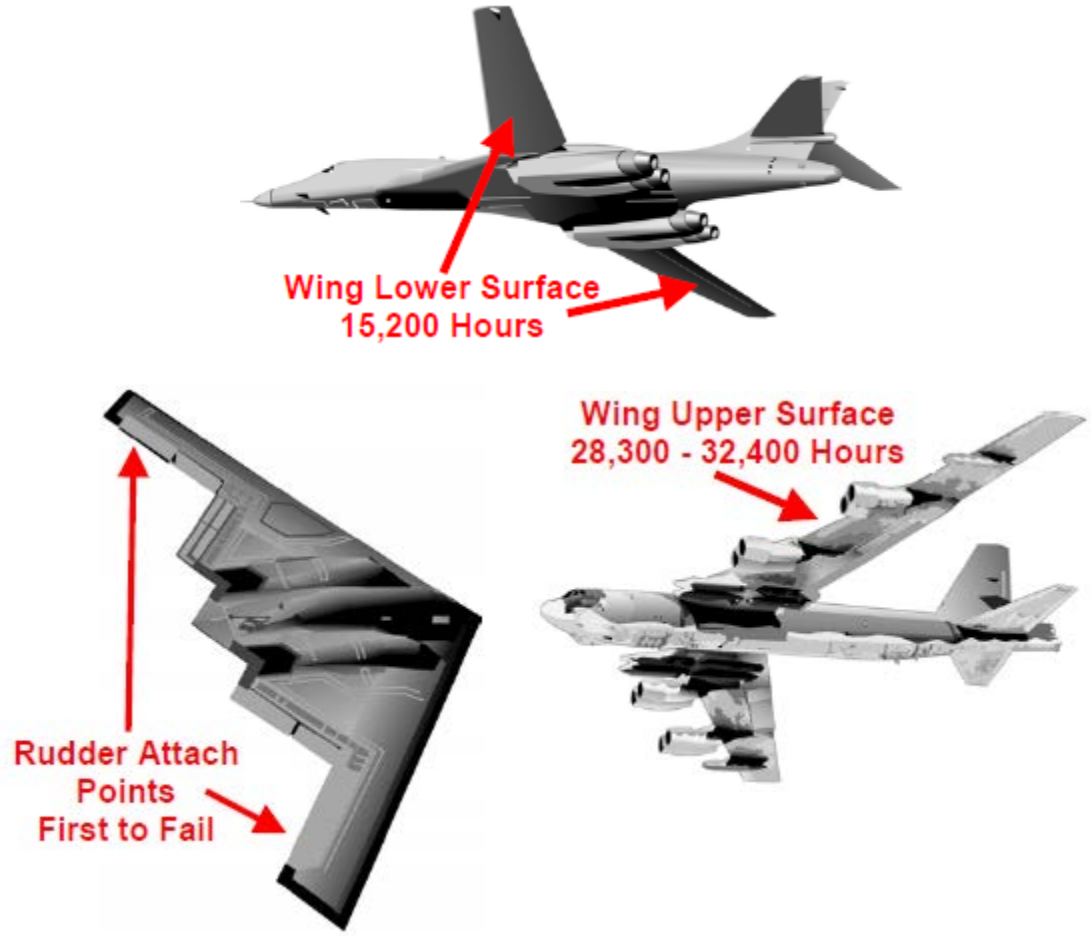

Figure 5: Bomber Service Life (USAF, 2001)

In December 2001, the Bush administration released its Nuclear Posture Review.

The 2001 NPR proposed a new nuclear triad to combat terrorist and rogue nations. The first leg of the new Triad was "Nonnuclear and Nuclear Strike Capabilities," the second leg was "Active and Passive Defense," and the final leg was "Responsive Infrastructure." The new take on the Triad allowed the United States to use its full range of conventional and nuclear capabilities to provide a credible deterrent, while continuing to reduce its number of nuclear weapons and forces. Over the course of the Bush administration neglect of the nuclear forces peaked. The focus on the conventional war in the Middle East for eight years eroded the last of the atrophying structure within the nuclear forces. On August 31, 2007 a B-52H from the 96th Bomb Squadron unknowingly and without authorization transferred six advanced cruise missiles loaded with nuclear warheads from Minot Air Force Base to Barksdale Air Force Base. The unauthorized transfer of nuclear cruise missiles stunned the nation and forced the Department of Defense and Bush administration to focus on U.S. nuclear operations. The incident resulted in the restructuring of the U.S. Air Force's nuclear forces under a new Major Command, Air Force Global Strike Command. The attention from the incident highlighted the neglect of the United States nuclear forces with many lawmakers calling for a reinvigoration of the nuclear enterprise.

President Barack Obama: Concrete Steps Toward a Nuclear Free World

President Obama inherited a nuclear enterprise looking to rebound after a series of events that left the world questioning the United States' nuclear credibility. On April 5, 2009, after being in office for three months, President Barack Obama addressed the international community in Prague, the capital city of the Czech Republic. In his speech, President Obama addressed the world's concerns about the United States nuclear

credibility and laid out his agenda to rid the world of nuclear weapons. President Obama presented a seven point plan his administration was going to employ, with the goal of achieving global zero. He called for a greater reduction of nuclear weapons, to maintain a safe, secure, and effective arsenal, to strengthen the Non-Proliferation Treaty, to ratify the Comprehensive Test Ban Treaty, to seek a Fissile Material Cut-off Treaty, and he called for the world to combat nuclear terrorism (Air Force Nuclear Weapons Center: 40). Since 1945 the U.S.' nuclear weapons stockpile grew to an unbelievable 31,255 warheads and by the time of his speech the United States had less than 5000 warheads in the weapons stockpile. "The existence of thousands of nuclear weapons is the most dangerous legacy of the Cold War. In a strange turn of history, the threat of global nuclear war has gone down, but the risk of a nuclear attack has gone up" (Obama, 2009). Figure 6, depicts the U.S. nuclear weapons stockpile from 1945 through 2009.

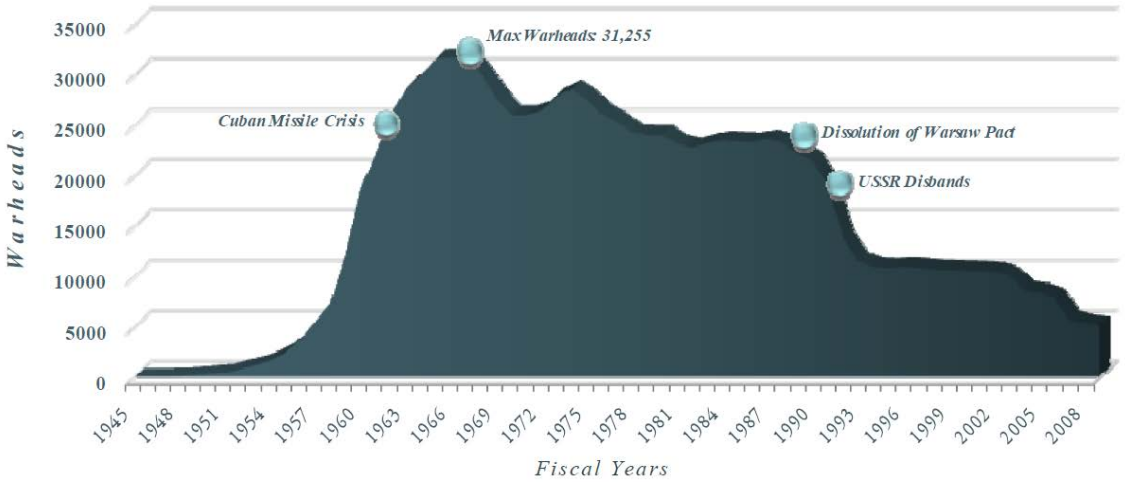

FIGURE 6: U.S. Nuclear Weapons Stockpile, 1945-2009 (DoD, 2010)

In July 2009, the New Deterrent Working Group published a white paper entitled "U.S. Nuclear Deterrence in the 21st Century: Getting it Right." In the eyes of U.S. civilians and the international community, the credibility of the U.S. deterrent

encountered several setbacks. The working group's intent was to address several key areas within the strategic nuclear forces, in order to improve the deterrent's credibility. The importance of quickly correcting the issues facing the nuclear forces was a top priority for the Obama administration. "U.S. nuclear forces provide a "nuclear umbrella" to allies, historically acting as the ultimate guarantor of their security. This "extended" deterrent has also allowed our allies and friends to forgo pursuit of their own nuclear arsenals" (NDWG, 2009: 11). It is important to note that since 1981, warhead levels were reduced from 12,000 deployed weapons to just 2,200 by 2009 and in 2010 New START placed further restrictions on the U.S. (NDWG, 2009: 11). Additionally, "as of the end of 2007, the total [U.S.] stockpile was almost 50 percent below what it was at the start of this millennium and by 2012 the stockpile was reduced another 15 percent. This means the U.S. nuclear stockpile will be less than one-quarter of its size at the end of the Cold War-the smallest stockpile in more than 50 years" (NDWG, 2009: 11).

The U.S. nuclear forces had not only been dramatically reduced, but faced years of neglect because of the lack of a perceived threat. In 2008, General Kevin Chilton, Commander of U.S. Strategic Command, warned "other declared nuclear powers continue to modernize their nuclear weapons, delivery platforms, and infrastructure. Conversely, the U.S. has effectively eliminated its nuclear weapons production capacity and allowed its infrastructure to atrophy" (NDWG, 2009: 24). In order to provide a credible deterrent the New Deterrent Working Group noted that five principles should govern the United States' approach to deterrence:

1. The United States cannot rely indefinitely on its existing arsenal;
2. The U.S. arsenal must be sized and tailored to hedge against uncertainty;

3. The United States continues to require a robust triad;
4. Missile defenses must be an integral part of the American deterrent;
5. A real capability to perform underground tests of nuclear weapons is required (NDWG, 2009: 40).

Clearly, the New Deterrent Working Group addressed the concern of U.S. nuclear credibility with their five principles for U.S. deterrence. However, they did not provide any details on increasing or limiting the strategic nuclear forces.

While the New Deterrent Working Group addressed some major issues concerning the strategic nuclear forces, it took the 2010 NPR and New START to place further limits on the size and structure of the forces. In the last 23 years the nuclear policy and strategy of the United States has only been reviewed three times. The reviews were started post-Cold War, the first in 1994 by President Clinton and the second in 2002 by President Bush. The 2010 Nuclear Posture Review is the third assessment, it provides a drastic change in nuclear strategy and policy, receiving direction from President Obama's 2009 Prague speech. "The 2010 Nuclear Posture Review outlines the Administration's approach to promoting the President's agenda for reducing nuclear dangers and pursuing the goal of a world without nuclear weapons, while simultaneously advancing broader U.S. security interests" (Obama, 2010). This review addresses five areas of nuclear policy and posture:

1. Preventing nuclear proliferation and nuclear terrorism;
2. Reducing the role of U.S. nuclear weapons in U.S. national security;
3. Maintaining strategic deterrence and stability at reduced nuclear force levels;
4. Strengthening regional deterrence and reassuring U.S. allies and partners; and

5. Sustaining a safe, secure, and effective nuclear arsenal (Obama, 2010: iii).

While the 2010 review outlines steps to be taken in the short term, five to ten years after its implementation, it purposefully lays out the foundation for the United States' nuclear policy for a much longer term (Obama, 2010: iv). To begin with, the 2010 NPR addresses nuclear proliferation and nuclear terrorism, the two greatest threats to the United States. President Obama argues the "massive nuclear arsenal we inherited from the Cold War era of bipolar military confrontation is poorly suited to address the challenges posed by suicidal terrorists and unfriendly regimes seeking nuclear weapons" (Obama, 2010: v). The goal of the Obama administration was to accomplish the objectives established in the NPR with a significantly smaller nuclear force. Thanks in large part to the end of the Cold War, U.S. conventional capabilities, and greatly improved missile defenses, the Obama administration could meet the objectives established by President Obama, but the administration had to re-shape the United States nuclear policy and posture. Six major changes to the nuclear policy and posture were implemented:

1. By reducing the role and numbers of U.S. nuclear weapons-meeting our NPT Article VI obligation to make progress toward nuclear disarmament-we can put ourselves in a much stronger position to persuade our NPT partners to join with us in adopting the measures needed to reinvigorate the non-proliferation regime and secure nuclear materials worldwide.
2. By maintaining a credible deterrent and reinforcing regional security architectures with missile defenses and other conventional military capabilities, we can reassure our non-nuclear allies and partners worldwide of

our security commitments to them and confirm that they do not need nuclear weapons capabilities of their own.

3. By pursuing a sound Stockpile Management Program for extending the life of U.S. nuclear weapons, we can ensure a safe, secure, and effective deterrent without the development of new nuclear warheads or further nuclear testing.
4. By modernizing our aging nuclear facilities and investing in human capital, we can substantially reduce the number of nuclear weapons we retain as a hedge against technical or geopolitical surprise, accelerate dismantlement of retired warheads, and improve our understanding of foreign nuclear weapons activities.
5. By promoting strategic stability with Russia and China and improving transparency and mutual confidence, we can help create the conditions for moving toward a world without nuclear weapons and build a stronger basis for addressing nuclear proliferation and nuclear terrorism.
6. By working to reduce the salience of nuclear weapons in international affairs and moving step-by-step toward eliminating them, we can reverse the growing expectation that we are destined to live in a world with more nuclear-armed states, decrease incentives for additional countries to hedge against an uncertain future by pursuing nuclear options of their own (Obama, 2010: vi).

The Obama administration's policy placed an emphasis on reducing the number of nuclear weapons, their use in military strategy, reducing the number of strategic nuclear forces, ensuring the U.S. maintains credibility with conventional capability, and emphasized extending the life of current weapons over the development of new nuclear

weapons. The dramatic shift in nuclear posture was not intended to diminish the United States' deterrent, but to show resolve in leading the international community to a world without nuclear weapons. In fact, a key point often overlooked in the NPR is a short statement espousing the effectiveness of the United States strategic nuclear forces; "as long as nuclear weapons exist, the United States will sustain safe, secure, and effective nuclear forces" (Obama, 2010: v). The direction provided by the NPR was further supported by the New Strategic Arms Reduction Treaty.

On April 8, 2010 the United States and Russia signed the New Strategic Arms Reduction Treaty. New START was a treaty designed to replace the Strategic Arms Reduction treaty of 1991 and supersede the 2002 Strategic Offensive Reductions Treaty, also known as the Moscow Treaty, which was in effect through December 2012 (Woolf, 2011: 1). New START seeks to strengthen stability between the United States and Russia, while demonstrating U.S. resolve to rid the world of nuclear weapons and put a stop to nuclear proliferation. The treaty is comprised of 16 articles that outline the limits and provisions each nation agreed upon. New START places new limits on the total number of strategic nuclear forces and warheads. The treaty limits both parties to no more than 800 deployed and non-deployed ICBM and SLBM launchers and heavy bombers equipped to carry nuclear weapons. "Within that total, it limits each side to no more than 700 deployed ICBMs, deployed SLBMs, and deployed heavy bombers equipped to carry nuclear armaments" (Woolf, 2011: 2). As shown in Figure 7, the treaty limits both parties to 1,550 deployed nuclear warheads.

Treaty	START (1991)	Moscow Treaty (2002)	New START (2010)
Limits on Delivery Vehicles	1,600 strategic nuclear delivery vehicles	No limits	800 deployed and nondeployed ICBM launchers, SLBM launchers and heavy bombers equipped to carry nuclear weapons Within the 800 limit, 700 deployed ICBMs, SLBMs, and heavy bombers equipped to carry nuclear weapons
Limits on Warheads	6,000 warheads attributed to ICBMs, SLBMs, and heavy bombers 4,900 warheads attributed to ICBMs and SLBMs 1,100 warheads attributed to mobile ICBMs 1,540 warheads attributed to heavy ICBMs	1,700-2,200 deployed strategic warheads No sublimits	1,550 deployed warheads No sublimits
LImits on Throwweight	3,600 metric tons	No limit	No limit

Figure 7: Limits in START, Moscow Treaty, and New START (Woolf, 2011)

The limits imposed by New START were a means to show the U.S. commitment to lead the international community to a world without nuclear weapons. By 2021, when New START will expire, the United States will only have 1,550 deployed nuclear warheads. This leaner nuclear force will have an impact on how the United States will shape its future strategic nuclear force, specifically the size and makeup of the bomber fleet.

U.S. Strategic Nuclear Forces

In 2012, Hans Kristensen and Robert Norris addressed the actual state of the United States' strategic nuclear forces. By 2012, New START had been the law of the land for nearly two years. In fact, New START inspections were well under way by that point in time, but U.S. reductions to meet the new limits presented in the treaty had yet to

begin (Kristensen, 2012: 85). In order to comply with the treaty, the Obama administration set an aggressive timeline to meet the new terms; "the United States will reduce, before February 2018, the number of deployed strategic delivery vehicles to a maximum of 240 submarine-launched ballistic missiles, 420 intercontinental ballistic missiles, and 60 nuclear-capable heavy bombers" (Kristensen, 2012: 85). This is a reduction of "48 SLBMs, 30 ICBMs, and 34 B-52Hs" (Kristensen, 2012: 85). Furthermore, in January 2012, the Pentagon "published a new strategy claiming it is possible that our deterrence goals can be achieved with a smaller nuclear force" (Kristensen, 2012: 87). The decision was made to further reduce the number of deployed ICBMs to 400. The sea based leg of the triad is comprised of 14 Ohio-class SSBNs, 8 stationed in the Pacific and 6 based in the Atlantic, employing the Trident II D5 SLBM. In order to meet the Obama administration's aggressive timeline and New START limits, each of the Navy's 14 SSBNs will carry only 20 SLBMs instead of 24. As far as the bombers are concerned, the plan is to maintain 60 nuclear-capable heavy bombers. The 60 dual capable bombers will be comprised of 44 B-52Hs, stationed at Minot AFB and Barksdale AFB, and 16 B-2s stationed at Whiteman AFB. As of March 2014, "the United States now has 1,585 warheads on 778 deployed ICBMs, SLBMs, and heavy bombers" (Woolf, 2015: 1). Just one month later the Obama administration released their plan for the structure of the nuclear forces under New START limitations, depicted in Figure 8.

System	Deployed under START I (2001)		Planned for START II	
	Launchers	Accountable Warheads[a]	Launchers	Accountable Warheads
Minuteman III ICBMs	500	1,200	500	500
Peacekeeper ICBMs	50	500	0	0
Trident I Missiles	168	1,008	0	0
Trident II Missiles	264	2,112	336	1,680
B-52 H Bombers (ALCM)	97	970	76	940
B-52 H Bombers (non-ALCM)	47	47	0	0
B-1 Bombers[b]	90	90	0	0
B-2 Bombers	20	20	21	336
Total	**1,237**	**5,948**	**933**	**3,456**

Source: U.S. State Department and CRS estimates.

a. Under START I, bombers that are not equipped to carry ALCMs count as one warhead, even if they can carry up 16 nuclear bombs; bombers that are equipped to carry ALCMs count as 10 warheads, even if they can carry up to 20 ALCMs.

b. Although they still counted under START I, B-1 bombers are no longer equipped for nuclear missions.

Figure 8: U.S. Strategic Nuclear Forces Under New START (Woolf, 2015)

The reductions in nuclear forces can be traced back to 1991, to the fall of the Soviet Union. Every U.S. presidential administration since that time has argued that we no longer view the Russians as enemies and we should not size or structure U.S. nuclear forces to deter a "Russian threat" that no longer exists (Woolf, 2015: 38). However, the size of the total force is a more complicated problem, specifically when addressing the size and shape of the heavy bomber force. These assets provide the United States the ability to execute a global strike mission in both the conventional and nuclear mission areas. Determining the right number of aircraft to support both missions is crucial to the bomber assurance and deterrence mission. Over the course of the last eight years President Obama has continued to pursue his Prague agenda. The United States has continued to lead the world in reducing the number of nuclear weapons in its inventory while ensuring the security of America and its allies.

Bomber Force Structure

Currently there are 158 aircraft in the bomber force. The current bomber force is comprised of 63 B-1Bs, 20 B-2s, and 75 B-52Hs. "This force yields "96 combat coded" aircraft that are assigned to perform operational missions. The remaining 62 bombers serve as training and test assets or are in depot undergoing periodic maintenance. Advanced IADS pose a challenging tactical problem for the Air Force to solve. In order to defeat the new threat a new aircraft is in development, the B-21 Raider. The B-21 is expected to replace the aging B-1B and B-52H aircraft, "if the United States procures only 100 new bombers and retains the existing force of 20 B-2s, the total bomber inventory will be 120 aircraft by 2045, with approximately 100 combat-coded bombers available for conventional and nuclear operations" (Moeller, 2015: 16). The decision has been made to purchase 100 B-21 Long Range Strike-Bombers (LRS-B) at a fixed unit cost of $550 million. It will be a dual capable aircraft, performing both the conventional and nuclear missions, with the capability to be manned by an onboard crew or piloted remotely (Gertler, 2016: 1). The contract was awarded to Northrop Grumman in October 2015, "the Air Force anticipates IOC approximately 10 years from the contract award" (Gertler, 2016: 4). While the acquisition of the B-21 addresses the aging bomber fleet and advanced IADS problems, it complicates treaty implementation, in terms of the maximum allowable deployed heavy bombers, and creates a manning issue that must be addressed.

III. Methodology

Chapter Overview

The research conducted, in order to provide an answer to the four questions outlined in Chapter 1, was predominantly qualitative in nature. Qualitative research allows the researcher to conduct an in-depth examination of a topic in order to "seek better understandings of complex situations" (Leedy, 2016: 80). Additionally, a qualitative research method allows the researcher to "operate under the assumption that reality is not easily divided into discrete, measurable variables" (Leedy, 2016: 81). This allows the researcher to address any complex problems through the use of inductive reasoning. Typical qualitative data analysis, is by design, subjective. The researcher is then enabled to make specific observations and "then draw inferences about the larger and more general phenomena" (Leedy, 2016: 82). This is accomplished by a thorough investigation of the data "in search of patterns, subjectively identified, that the data reflect" (Leedy, 2016: 82). Due to the highly classified nature of the B-21 program, the use of a qualitative research method was essential to provide the depth of analysis required to thoroughly explore the subject matter.

Role of the Researcher

The researcher employed a triangulation technique throughout the course of the case study. Analyzing data from three different sets of sources allows the researcher to build a coherent justification for themes found throughout the study (Creswell, 2014: 201). "Themes are established based on converging several sources of data" (Creswell, 2014: 201). The researcher gathered data from official government reports and analyses, reports and documents not produced as an official government product, and from the

researcher's personal professional experience. The researcher looked for areas where the research converged across the three categories. Four themes were deciphered from the research: budget, force structure, upgrade (aircraft and weapons), retirement.

It is important to note the role of the researcher in qualitative research. Creswell remarks, "the role of the researcher as the primary data collection instrument necessitates the identification of personal values, assumptions and biases at the outset of the study" (Creswell, 2014: 207). I am an active duty Air Force officer with extensive knowledge of current bomber operations. I have been on active duty for 13 years and operating B-52H aircraft for 11 years. I am a Weapons System Officer (WSO) and United States Air Force Weapons School graduate with more than 1,900 flying hours. By virtue of being assigned to a dual capable aircraft, I have extensive knowledge of both the conventional and nuclear missions. Additionally, I have been stationed at both B-52 wings. My personal experience will bring keen insight into the examination of the policy decisions made over the past 25 years to the structure of the current bomber force and will allow the researcher to make educated inferences on the future force structure.

The researcher utilized the case study qualitative research methodology. The single-case design is optimally suited for comprehensive data collection relative to a single program for the purpose of better understanding a situation (Leedy, 2016: 84). This qualitative methodology allowed the researcher to gather detailed data concerning the USAF bombers and will help to provide detailed inferences and analysis on the future of the bomber forces.

Case Study

In order to properly address what the bomber force structure should look like in the future, a detailed examination of the current force structure was required. "Case studies are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a program, event, activity, process or one or more individuals" (Creswell, 2014: 14). The researcher employed a single-case design, framing the case study around how the United States arrived at the current bomber force structure. According to John W. Creswell, cases are bound by time and activity (Creswell, 2014: 14). This case study encompasses data, specifically addressing the size and structure of the bomber force, from 1992 to present. Six major papers, analyzing the bomber structure, were produced during the 25 year period covered by the study. In 1992, the Department of the Air Force conducted an analysis of the post-Cold War bomber force, culminating in the release of *The Bomber Roadmap. The Bomber Roadmap,* outlined a plan for the bomber forces to shift focus from the nuclear to the conventional mission. It focused on survivability, bomber and weapons upgrades, and flexibility, while facing decreasing defense budgets. Following the release of *The Bomber Roadmap,* Secretary of Defense Les Aspin commissioned the *Bottom-Up Review* in 1993. The *Bottom-Up Review* was a holistic study of the entire structure of the armed forces. The study specifically addressed the bomber forces, advocating for modifications for the aircraft to carry smart munitions and ensuring the United States would provide an effective deterrent within treaty limitations. A year later in 1994, an analysis of the bomber force structure was conducted by the RAND Corporation. The analysis, *Providing an Effective Bomber*

Force for the Future, looked at two options for fielding future bomber forces, ultimately concluding that the *Bottom-Up Review's* proposed force was sufficient. Three years later in 1996 a fourth study was released, *Air Force Bombers: Options to Retire or Restructure Would Reduce Planned Spending.* The GAO study highlighted several areas where money could be saved. It advocated for the retirement of the B-1B and capping the production of the B-2 to 21 aircraft, while maximizing the use of the B-52H. Following the GAO study, in 1999 the Air Force released the *White Paper on Long Range Bombers.* The white paper argued for the Air Force to operate a smaller fleet and advanced munitions to maintain its lethality. The sixth and final study, was the 2001 *U.S. Air Force Long Range Strike Aircraft White Paper.* This white paper, updated with more accurate data concerning aircraft age, lobbied for a reduced bomber force of 157 aircraft, one aircraft fewer than the number in the current fleet. Chapter 2 examined the roles these documents played in each presidential administration's decision to decrease the number of aircraft in the bomber force. Furthermore, the examination of the material in Chapter 2 combined with the researcher's personal experience within the bomber community allowed the researcher to conduct thorough analysis of the subject matter.

IV. Analysis and Results

Chapter Overview

In order to answer the question, "h*ow will the acquisition of 100 B-21 stealth bombers redefine the size and composition of the U.S. bomber force,"* the researcher conducted a case study of the bomber force. The study looked at data, specifically post-Cold War policy decisions made to shape the current bomber force, in order to provide suggestions for the future force structure. This chapter provides a comprehensive analysis of the data provided in Chapter 2.

Research Themes

As the Cold War drew to an end, policy makers analyzed the policies and strategy in place designed to combat the former Soviet Union. The decision to address the size of the military, its posture and budget occurred shortly after President Bush entered office. Triangulation of personal experience (PE), official government reports (OR) and reports not produced as an official government product (NR) allowed the researcher to pinpoint themes found in the data. Four themes; budget, force structure, upgrades (aircraft and weapons), and retirement, were identified through the course of the research.

The first of the four themes identified in the data was budget. 63% of the OR reports contained an analysis of the Department of Defense budget or mentioned cost as contributing factor for reductions to the bomber force. The OR data points to a conflict in the money budgeted for the development and procurement of new assets and operating costs of legacy weapon systems for a military no longer facing the threat of Soviet attack. Conversely, none of the NR reports provided a budget analysis or

mentioned money as a factor to increase or decrease the bomber force. PE analysis indicates current fiscal constraints are still a factor in shaping the size and composition of the bomber force. Acquisition cost of the B-21 has been heavily scrutinized by Congress. In an effort to keep the program costs from ballooning the Air Force identified unit cost as a key performance factor. "The firm-fixed-price procurement contract appears to put much of the risk for subsequent cost increases on the contractor" (Gertler, 2016: 10). Additionally, the Department of Defense has been operating without a set budget under a continuing resolution, adding to the complexity of making decisions regarding force structure.

The second theme, force structure, was addressed in every report used in the research. OR data overwhelmingly advocated for a force reduction. Additionally, OR data highlighted policy makers desire to shift focus from the nuclear mission to the conventional mission post-Cold War. NR data provided a wider range of findings. Of note, two reports stood out; RAND's *Providing an Effective Bomber Force for the Future* and the Mitchell Institute's *U.S. Bomber Force: Sized to Sustain an Asymmetric Advantage for America*. The RAND report, a mid-1990s analysis, was a deep dive into the future bomber force structure, which validated the Bottom-Up Review's (OR) conclusion the U.S. could reduce its bomber force and still remain effective. The Mitchell Institute's report provided an analysis of the Air Force's decision to buy just 100 B-21 bombers. The report advocates for a bomber force with an end strength of 150-200 bombers. PE provides inconclusive findings. The current bomber force is supporting operations around the globe. Units are executing 6 month deployments, Bomber Assurance and Deterrence missions, participating in flag level exercises, and

executing home station training requirements. It is possible to continue current operations with a reduced number of bombers, but it depends on the capabilities the new bomber will bring to the fight.

Themes three and four are upgrade (aircraft and weapons) and retirement. Upgrade refers to modernization efforts for both the aircraft and the weapons employed by the weapon systems. Data from the OR reports point to a desire to trade aircraft for increased capability, a smaller more lethal force. The NR data acknowledged the need for increased capability, but did not make the same argument for a smaller more lethal force, found in OR reports. From the PE standpoint, as bombers age and threat capabilities increase, there will be a need for U.S. bombers to upgrade their capability in order to defeat future threats. The B-21 will bring advanced low observable technology and increased weapon capability the current bomber force does not employ. Of the 16 documents used in the research only three reports mentioned the retirement of aircraft. Most notably, an OR report specifically proposed the retirement of the B-1B. The GAO's *Air Force Bombers: Options to Retire or Restructure the Force Would Reduce Planned Spending,* proposed the early retirement of the B-1 in order to save money. From a PE point of view, the B-21 was specifically designed to replace two ageing aircraft. Due to limited resources, manning, funding, infrastructure, at some point in the near future the Air Force must designate a weapon system to retire in order to begin fielding the B-21. Figure 9, compiles all the reports used for this research. The figure designates between OR and NR reports and lists the themes found in each report.

Title	Organization	Theme Code	Budget	Force Structure	Upgrade (Aircraft and Weapons)	Retirement
Air Force B-21 Long Range Strike Bomber	Congressional Research Service	OR	✓	✓		✓
Air Force Bombers: Options to Retire or Restructure the Force Would Reduce Planned Spending	Government Accountability Office	OR	✓	✓	✓	✓
New Strategic Arms Reduction Treaty	Treaty	OR		✓		
Nuclear Posture Review	Department of Defense	OR		✓	✓	
Report on the Bottom-Up Review	Department of Defense	OR	✓	✓	✓	
The Bomber Roadmap	Department of the Air Force	OR	✓	✓	✓	
The New START Treaty: Central Limits and Key Provisions	Congressional Research Service	OR		✓		
U.S. Air Force Communications Wayoints: B-21	Department of Defense	OR	✓	✓		
U.S. Air Force Long-Range Strike Aircraft White Paper, 2001	Department of Defense	OR	✓	✓	✓	
U.S. Air Force White Paper on Long Range Bombers, 1999	Department of Defense	OR	✓	✓	✓	
U.S. Strategic Nuclear Forces: Background, Developents, and Issues	Congressional Research Service	OR		✓	✓	✓
A Study of Nuclear Enterprise Perspectives on U.S. Nuclear Force Structure	Research Paper	NR		✓		
Providing an Effective Bomber Force for the Future	RAND	NR		✓	✓	
U.S. Bomber Force: Sized to Sustain an Asymmetric Advantage for America	Mitchell Institute	NR		✓	✓	
U.S. Nuclear Forces: 2012	Bulletin of the Atomic Scientists	NR		✓		
U.S. Nuclear Deterrence in the 21st Century: Getting it Right	The New Deterrent Working Group	NR		✓	✓	

Figure 9: Theme Convergence

Investigative Question 1

In 1989, prior to the end of the Cold War, the bomber force was comprised of 360 aircraft. Over the last 25 years the Department of Defense and the United States Air Force has made the conscious decision to reduce the number of aircraft in the bomber force. The current force is comprised of 158 bombers, a mix between B-1B, B-2, and B-52H aircraft, a post-Cold War Era reduction of 56%. The reduction in aircraft is largely attributed to two fundamental changes in military operations, the end of the Cold War and advancement in technologies. In 1992 the military was still spending money and sized to fight a Cold War threat that no longer presented a danger to the United States. Once the Soviet Union imploded, U.S. policy makers began advocating for a reduction in forces, specifically the bomber force, and each military branch faced

significant decreases in their budget. The first to feel the post-Cold War impact was the Air Force. President Bush enacted PNI 1 in late 1991. PNI 1 "removed strategic bombers and ICBMs from alert, 450 Minuteman II silos were stood down, all deployed ground-launched short range nuclear forces were recalled and slated for retirement and elimination, nonstrategic nuclear weapons were ordered removed from deployment on Navy ships and submarines, and the development programs for mobile ICBMs, small ICBMs, and SRAM II missiles were canceled" (Kunsman, 2001: 64). Shortly after PNI 1 was enacted, President Bush released PNI 2. "PNI 2 signaled the end to the production of new warheads for the Trident missile, the procurement of the B-2 was terminated, the Advanced Cruise Missile build was shortened, and the production of the Peacekeeper missile was stopped (Kunsman, 2001: 64). PNI 2 had a significant impact on the not only the strategic nuclear forces, but the bomber force as well. The original B-2 acquisition plan called for the purchase of 132 aircraft, the PNI stopped the buy at only 21. The 1992 release of the *Bomber Roadmap*, highlighted the Air Force's desire to have a smaller more technologically advanced force. "The Roadmap laid out a careful, fiscally prudent plan to capitalize on the global reach inherent in the bomber force. It focused on enhancing survivability, weapons carriage, and flexibility to match the demands of decreased overseas presence, declining defense budgets, and continuing American interests overseas" (Department of the Air Force, 1992, 1). While the B-2 acquisition was cut by 84%, the low observable technology employed by the B-2 brought a significant increase in capability to the bomber force. In the early 1990s the 21 stealth aircraft offered the capability to penetrate enemy IADS with a significant decrease in the enemy's ability to detect the aircraft, which represented an unparalleled

advantage for the United States. Through the 1990s several studies were conducted to determine the right size and structure of the bomber force. The studies concluded a small lethal bomber force, focusing primarily on the conventional mission and secondarily on the nuclear mission was the direction the Department of Defense should take, with respect to the force structure.

Since the end of the Cold War the Air Force has continued down the path of a smaller more lethal bomber force. Currently, the Air Force maintains a bomber force of 158 aircraft. Of the 158 aircraft, 96 of the bombers are "combat-coded." 60 of the 96 combat-coded bombers are dual capable, 44 B-52Hs and 16 B-2s. The decision to reduce the bomber force was made 25 years ago and two years ago the United States made a decision that will impact the bomber force over the next 25 years. The U.S. is currently attempting to modernize all three legs of the strategic nuclear forces, spending nearly $1 trillion dollars over the next 30 years. In October 2015 Northrop Grumman was awarded the B-21 contract. The contract is for the acquisition of 100 aircraft at a procurement cost of $511M each, with an initial operational capability (IOC) in the mid-2020s. It will be a dual capable aircraft, nuclear certified within 2 years of IOC. The Department of Defense and Air Force leadership made the decision that 100 B-21 aircraft will be the "backbone of the bomber fleet with the capability to survive and penetrate enemy defenses well into the 21st century" (USAF, 2016). Former Secretary of the Air Force Deborah Lee James said, "The B-21 is critical to national defense and is a top priority for the Air Force. We face a complex security environment" (USAF, 2016). Additionally, the B-21 is intended to replace the ageing B-1B and B-52H aircraft. This means that by 2045, when both the B-1B and B-52H are projected to

retire, the entire bomber fleet will consist of 120 stealth aircraft a 37% reduction in the current bomber force. There is a strong correlation from the data found in both the official government reports and the reports not produced as an official government product that indicate once a force structure decision is made the Air Force will adhere to the plan. All of the official government reports since 1992 propose a smaller bomber force with upgraded aircraft and weapons capability. In the 1990s the Department of Defense decided to reduce the number of bomber aircraft and today's bomber force of 158 aircraft is the result. The research data indicates the Department of Defense and Air Force leadership still desire a smaller more lethal bomber force. As a result, the decision to purchase 100 B-21 aircraft will create a leaner bomber force, comprised solely of stealth bombers, capable of penetrating enemy IADS. Although the bomber force will be smaller, the advanced technology the B-21 will bring to the Air Force will allow the bomber force to continue to provide an effective deterrent. Ultimately, the B-21 acquisition will have a positive impact on U.S. nuclear deterrence in the future.

Investigative Question 2

As the Air Force moves closer to the acceptance of the first IOC B-21, the future size and composition of the bomber fleet comes into question. By 2045 the Air Force will have 120 bombers, the question that must be answered is "what happens with the B-1B and B-52H aircraft until we receive all 100 B-21s?" The Air Force does not have the funding or the manpower to operate three legacy aircraft while trying to standup squadrons for the new acquisition. A smart plan must be implemented that retires both the B-1B and B-52H aircraft while maintaining the ability to execute both the nuclear and conventional missions. Research data points to two options as the Air Force moves

forward with the B-21 acquisition; either slowly start retiring the B-1B aircraft or begin retiring the B-52H aircraft. The researcher found three official government documents that provide details relating to aircraft retirement. Two of the three documents acknowledge the B-21 is being procured to replace the ageing B-1B and B-52H aircraft, while the third argues the retirement of the B-1B will save nearly $6 billion for the Air Force. A decision must be made and that decision will greatly impact the bomber force.

Standing up maintenance and operations squadrons for the B-21 will require facilities, personnel, and funding. Both courses of action (COA) that will be presented address those three basic assumptions as the new bomber comes online. COA 1 is to retire the B-1B fleet. Since the mid-1990s policy makers have called for the retirement of the B-1B. In fact, in 1996 a GAO study indicated the United States could save $5.9 billion between 1997 and 2001 if the B-1 was retired (GAO, 1996: 12). The B-1B has 3 operational squadrons, based at two bomb wings. There are two operational units located at Ellsworth AFB in South Dakota and one operational unit at Dyess AFB in Texas. Additionally, the B-1B units are only tasked with the conventional mission. To begin, the Air Force should transition the B-1B flying training unit (FTU) at Dyess AFB from B-1Bs to B-21s, in order to create the initial cadre for the B-21. Since the B-21 will be optionally manned, all pilots and weapon system officers (WSO) can transition to the B-21. The aircraft from that squadron should be retired. This action will free up facilities, personnel, and funding. As more B-21 aircraft are delivered to the Air Force, the researcher recommends transitioning the single operational unit at Dyess AFB to B-21s and then both units at Ellsworth AFB to the B-21. Once the all the B-1B aircraft are retired, then the Air Force should transition the remaining B-52H squadrons to the B-21,

one by one. There will be no impact to the nuclear or conventional missions since both the B-2 and B-52H are dual capable.

COA 2 calls for retiring of the B-52H first. The B-52H is the oldest bomber in the fleet, but makes up the majority of the aircraft executing the nuclear mission. Since the B-21 is not anticipated to be nuclear certified until two years after its initial IOC, this COA inherently levies more risk to the nuclear mission. There are four operational B-52H units, based at two bomb wings. There are two units located at Barksdale AFB in Louisiana and two units located at Minot AFB in North Dakota. Similar to the first COA, the first unit to transition should be the FTU located Barksdale AFB. This would create capacity to produce future B-21 aviators. As the B-21 aircraft are delivered, the first units to transition should be the squadrons located at Barksdale AFB and their aircraft should be retired. This action will have minimal impact on the B-52H nuclear mission. After the B-21s have been nuclear certified, then the remaining two units at Minot AFB should transition to the B-21. Once the all the B-52H units have transitioned to the B-21, the B-1B units should start their transition. This COA allows the B-1B units to continue to execute the conventional mission while the B-52Hs transition to B-21s, with minimal impact, and still allows the B-52H to execute the nuclear mission until the B-21 is nuclear certified.

Ultimately, the acquisition of 100 B-21 aircraft will have a significant impact on the size and composition of the bomber forces. By 2045 the total fleet size will be 120 aircraft, a reduction of 37% from the bomber force's current size. The bomber force will only be comprised of two aircraft, both stealth, and both dual capable aircraft. Civilian

and Air Force leadership want the B-21 to be the backbone of the bomber force, but in order to reach this goal two aircraft types must be fully retired.

Investigative Question 3

Developing and acquiring new long range bombers is a difficult task in itself, compounding the problem are treaty limitations. The United States is on a vector to have 120 bomber aircraft by 2045. Under New START limitations only 60 aircraft are designated for the nuclear mission. New START is set to expire at the end of 2021 and the U.S. will most likely pursue a new treaty with Russia. Currently, New START limits both the U.S. and Russia to no more than 800 deployed and non-deployed ICBM and SLBM launchers and heavy bombers equipped to carry nuclear weapons. "Within that total, it limits each side to no more than 700 deployed ICBMs, deployed SLBMs, and deployed heavy bombers equipped to carry nuclear armaments" (Woolf, 2011: 2). Moving forward, the U.S. needs to consider the impact the B-21 will have on the negotiations of future treaties. As of today there are not enough data to determine whether the B-21's advanced technology will provide enough capability to execute the nuclear mission with fewer aircraft. Based on the limited data, it is the researcher's recommendation that the United States should not reduce the number of aircraft designated for the nuclear mission. The U.S. should consider 60 bomber aircraft the minimum to provide an effective deterrent for future strategic nuclear reduction treaties until further analysis of the B-21's capabilities and their impact on the nuclear mission is accomplished. Moving forward, the hardest part of future treaty negotiations will be the transition period between the B-52H retiring and the last delivery of the remaining B-21 aircraft. Senior leaders will have to manage which aircraft are designated for the nuclear

mission. Treaty constraints will only impact the number of aircraft designated for the nuclear mission, but may not have an impact on the overall size or structure of the bomber force. The key to success for the United States is to ensure the bomber forces has the appropriate number of aircraft designated to provide an effective nuclear deterrent.

V. Conclusion

Chapter Overview

For the last two decades the United States has maintained air superiority with a much smaller more technologically advanced Air Force. Each of the Air Force's long range bombers have played an important role in the nation's defense, but adversaries of the future will be more resolved to deny the U.S. the ability to project air power. In order to defeat future threats and to replace ageing aircraft, the Department of Defense and the Air Force decided to acquire the B-21. The acquisition of the new aircraft will impact the size and composition of the bomber force. The Air Force must develop a plan for the introduction of the B-21 into the bomber force and the retirement of the B-1B and B-52H, so there is not an impact to the nuclear and conventional missions.

Summary of Research

The goal of this research was to answer the question "*how will the acquisition of 100 B-21 stealth bombers redefine the size and composition of the U.S. bomber force*?" In order to thoroughly explore the research question, the researcher developed three additional investigative questions: how do the decisions the Department of Defense make today, concerning the status of U.S. nuclear bomber forces, impact U.S. nuclear deterrence in the future; what is the impact of the purchase of 100 B-21 aircraft on the composition and fleet size of bomber aircraft; how will treaty constraints impact the size and composition of the bomber force? Four assumptions were made during the research. The first assumption is that the USAF has determined that 100 B-21 aircraft is the right number of bombers to purchase and the DoD will purchase all 100 aircraft. The second

major assumption is the 100 B-21 long range strike bombers will replace the B-1B and the B-52H. The third assumption assumes that the B-21 will be an optionally manned aircraft, requiring one mission commander and one pilot to execute both manned and unmanned missions. Additionally, while flying manned missions the mission commander and pilot will both be qualified pilots and while flying unmanned missions the mission commander and pilot can be either a qualified pilot or a qualified remote piloted aircraft (RPA) pilot. The final assumption made for this research is that the B-1B and B-52H will remain in service until 2045 and at that time all 100 B-21 aircraft will be in service. In addition to the four assumptions, the researcher identified a single significant limitation to the research. The B-21 program is classified at the Special Access Program level. Gathering specific data about the aircraft, projected manning, projected basing decisions and infrastructure will be challenging.

A qualitative research method was chosen to investigate the impact the B-21 acquisition will have on the future bomber structure. Qualitative research methods are often used to "seek better understandings of complex situations" (Leedy, 2016: 80). The researcher utilized the case study methodology to perform an in-depth analysis of the current bomber force structure. "Case studies are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a program, event, activity, process or one or more individuals" (Creswell, 2014: 14). The single-case design explored the policy decisions made during the 25 year period from 1992 through 2017. During the time period there were six major studies performed to determine the size and composition of the bomber force. The first of the studies was *The Bomber Roadmap*, released in 1992. This initial study outlined a post-

Cold War plan for the bomber forces to shift focus from the nuclear to the conventional mission. The study focused on survivability, bomber and weapons upgrades, flexibility, while facing decreasing defense budgets. Shortly after *The Bomber Roadmap* was released, *The Bottom-Up Review* was commissioned. *The Bottom-Up Review* emphasized reducing the bomber force while upgrading the aircraft and munitions. In 1994 the RAND Corporation released an analysis of *The Bottom-Up Review's* proposed bomber force structure. *Providing an Effective Bomber Force for the Future* proposed two different bomber force structures and ultimately determined *The Bottom-Up Review* proposed force structure would be adequate in the future. Two years later, in 1996, *Air Force Bombers: Options to Retire or Restructure Would Reduce Planned Spending* was released. This GAO study analyzed what restructuring the bomber force could do, in terms of reducing costs and saving money. The study advocated for retiring the B-1B, stopping the acquisition of the B-2, and upgrading the B-52H. In 1999 the Air Force released the *White Paper on Long Range Bombers*, which advocated for a smaller more lethal bomber fleet. Then in 2001 the Air Force released a second study, the *U.S. Air Force Long Range Strike Aircraft White Paper*, which advocated for 157 bomber aircraft. The data from the studies show the intent of the United States, since the end of the Cold War, is to have a smaller bomber force that has significant upgrades to the aircraft and munitions, allowing the force to continue to execute the nuclear and conventional missions.

The procurement of the B-21 will no doubt have an impact on the future size and composition of the bomber force. The data from the case study indicates the decisions we make today will have a direct impact on U.S. nuclear deterrence in the future. To

begin with, the total number of bomber aircraft will decrease by 37%. By 2045 the United States will only employ 120 bombers. The decision to purchase 100 B-21 aircraft will create a leaner bomber force, comprised solely of stealth bombers, capable of penetrating enemy IADS. Although the bomber force will be smaller, the advanced technology the B-21 will bring to the Air Force will allow the bomber force to continue to provide an effective deterrent. Furthermore, civilian and military leadership will need to address limitations imposed by treaties, restricting the number of aircraft designated for the nuclear mission. Currently, 60 aircraft are tasked with the nuclear mission. Leadership will have the tough decision to reduce or maintain the number of bomber aircraft for the nuclear mission in future treaty negotiations. The acquisition of 100 B-21 will create short term fleet management issues the Air Force must address, but by the time all the aircraft have entered service all of the issues will be resolved.

Recommendations for Action

The short term issues created by the B-21 acquisition will impact facilities, personnel, and funding. In order address the problems, the researcher provided two different courses of action in Chapter 4 for Air Force leadership to consider acting upon. COA 1 recommends transitioning B-1B units to the B-21, while maintaining B-52H aircraft to execute the nuclear mission. The B-1B is only tasked with the conventional mission and both the B-2 and B-52H are dual capable aircraft. The B-2 and B-52H can provide the proper coverage needed to execute both missions while the B-1B units transition to the B-21. COA 2 recommends transitioning B-52H units to the B-21, while maintaining B-1B aircraft for the conventional mission. The key to success for COA 2 is maintaining enough B-52Hs to execute the nuclear mission during the

transition until the B-21 is nuclear certified. Both COAs provide leadership an initial starting point and address the issues related with B-21 acquisition.

Recommendations for Future Research

There are two areas that need to be further researched to ensure the B-21 implementation is successful. To begin with, a study needs to be completed on the basing requirements for 100 new aircraft. Squadron facilities will need to be upgraded to incorporate higher classification mission planning environments, special hangars will be required for the aircraft, and determining which bases are best suited to base the aircraft is required. In addition to basing requirements, a study on manning requirements should be conducted. The aircraft will be optionally manned, so there will be requirement for individuals to be trained to remotely pilot the aircraft, as well as the requirement for traditional pilots. Maintaining proficiency could be an issue for pilots, an investment in high fidelity simulators and a T-38 companion program should be considered. Additionally, properly training maintenance personnel on sustainment of the new stealth technology will be significant. The B-21s stealth capability will require a new or more advanced skill set and some tasks performed could be rare enough that maintaining proficiency could be a chronic problem. Ensuring the operational and maintenance units are manned at the appropriate level and provided with the training and tools necessary to accomplish the mission is crucial to the success of the squadrons.

Summary

The backbone of the United States future bomber force will be the B-21. U.S. adversaries are developing and upgrading new and more robust IADS, to restrict the

United States' ability to gain and maintain air superiority. The current bomber force is ageing and two of the aircraft were not designed to combat the future threat. The B-21 is being procured to replace the ageing B-1B and B-52H bombers and to provide the U.S. ability to continue to project air power unimpededly. The B-21 will redefine the size and structure of the U.S. bomber force. The new bomber force will be smallest and most lethal force ever employed by the United States. Additionally, the bomber force will only employ two stealth dual capable aircraft. Managing the bomber force will be difficult, but the Air Force must find a way to smartly phase in the new aircraft while retiring the old and working within future treaty limitations.

The Nuclear Bomber Force in the 21st Century

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Abstract

The 21st century adversary is presenting challenges to the United States unlike anything the U.S. has previously encountered. Present day adversaries are challenging the ability of the U.S. to project airpower. Rapid growth in technology has allowed U.S. adversaries to develop robust air defense systems, creating contested areas that limit the ability of the United States to gain and maintain air superiority. These new defenses have created a difficult tactical problem for the both the U.S. conventional and strategic nuclear forces to solve. Not only does the bomber force have to contend with robust advanced integrated defenses, the fleet's age is becoming a concern. The United States Air Force currently has 158 bombers in its inventory. Currently, both the B-1B and the B-52H will remain in service until 2045. Age and threat capabilities are driving the Department of Defense to pursue a replacement for the B-1Bs and B-52Hs.. The goal of this research is to analyze the acquisition of 100 B-21 stealth bombers and determine the right size and composition of the U.S. bomber force and determine the impact the acquisition of a new stealth bomber will have on future nuclear arms treaties.

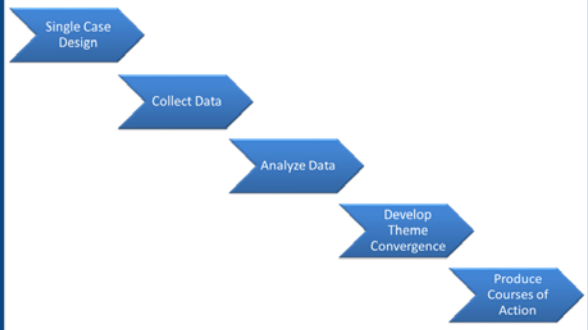

Figure 1: COA Development

Methodology

The research conducted was predominantly qualitative in nature. Qualitative research allows the researcher to conduct an in-depth examination of a topic in order to "seek better understandings of complex situations" (Leedy, 2016: 80). Typical qualitative data analysis, is by design, subjective. The researcher is then enabled to make specific observations and "then draw inferences about the larger and more general phenomena" (Leedy, 2016: 82). This is accomplished by a thorough investigation of the data "in search of patterns, subjectively identified, that the data reflect" (Leedy, 2016: 82). Due to the highly classified nature of the B-21 program, the use of a qualitative research method was essential to provide the depth of analysis required to thoroughly explore the subject matter.

In order to properly address what the bomber force structure should look like in the future, a detailed examination of the current force structure was required. "Case studies are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a program, event, activity, process or one or more individuals" (Creswell, 2014: 14). The researcher employed a single-case design, framing the case study around how the United States arrived at the current bomber force structure. This case study encompasses data, specifically addressing the size and structure of the bomber force, from 1992 to present.

Research Goals

The focus of this research will be on the acquisition of the B-21 long range strike bomber. The research will specifically address the impact 100 of the new bombers will have on the size and composition of the current bomber fleet and the bearing the new bombers will have on current and future nuclear arms treaties. The goal of this research is to provide courses of action for Air Force leaders to take as decisions are being made concerning the future of the nuclear strategic forces. This paper seeks to answer one primary research questions:

REASERCH QUESTION 1: How will the acquisition of 100 B-21 stealth bombers redefine the size and composition of the U.S. bomber force?

IQ1: How do the decisions the Department of Defense make today, concerning the status of US nuclear bomber forces, impact US nuclear deterrence in the future?

IQ2: What is the impact of the purchase of 100 B-21 aircraft on the composition and fleet size of bomber aircraft?

IQ3: How will treaty constraints impact the size and composition of the bomber force?

Title	Organization	Theme Code	Budget	Force Structure	Upgrade (Aircraft and Weapons)	Retirement
Air Force B-21 Long Range Strike Bomber	Congressional Research Service	OR	✓	✓		✓
Air Force Bombers: Options to Retire or Restructure the Force Would Reduce Planned Spending	Government Accountability Office	OR	✓	✓	✓	✓
New Strategic Arms Reduction Treaty	Treaty	OR		✓		
Nuclear Posture Review	Department of Defense	OR		✓	✓	
Report on the Bottom-Up Review	Department of Defense	OR	✓	✓	✓	
The Bomber Roadmap	Department of the Air Force	OR	✓	✓	✓	
The New START Treaty: Central Limits and Key Provisions	Congressional Research Service	OR		✓		
U.S. Air Force Communications Waypoints: B-21	Department of Defense	OR	✓	✓		
U.S. Air Force Long-Range Strike Aircraft White Paper, 2001	Department of Defense	OR	✓	✓	✓	
U.S. Air Force White Paper on Long Range Bombers, 1999	Department of Defense	OR	✓	✓	✓	
U.S. Strategic Nuclear Forces: Background, Developments, and Issues	Congressional Research Service	OR		✓	✓	✓
A Study of Nuclear Enterprise Perspectives on U.S. Nuclear Force Structure	Research Paper	NR		✓		
Providing an Effective Bomber Force for the Future	RAND	NR		✓	✓	
U.S. Bomber Force: Sized to Sustain an Asymmetric Advantage for America	Mitchell Institute	NR		✓	✓	
U.S. Nuclear Forces: 2012	Bulletin of the Atomic Scientists	NR		✓		
U.S. Nuclear Deterrence in the 21st Century: Getting it Right	The New Deterrent Working Group	NR		✓	✓	

Figure 2: Theme Convergence

Recommendations

1. COA 1 is the transition of B-1B units to the B-21, while maintaining B-52H aircraft to execute the nuclear mission. The B-1B is only tasked with the conventional mission and the B-2 and B-52H can provide the proper coverage needed to execute both missions while the B-1B units transition to the B-21. The Air Force should transition the B-1B flying training unit at Dyess AFB from B-1Bs to B-21s, in order to create the initial cadre for the B-21. As more B-21 aircraft are delivered to the Air Force, the researcher recommends transitioning the single operational unit at Dyess AFB to B-21s and then both units at Ellsworth AFB. Once the all the B-1B aircraft are retired, then the Air Force should transition the remaining B-52H squadrons to the B-21, one by one.
2. COA 2 is the transition of B-52H units to the B-21, while maintaining B-1B aircraft for the conventional mission. The key to success is maintaining enough B-52Hs to execute the nuclear mission during the transition until the B-21 is nuclear certified. The transition should start at the FTU located Barksdale AFB. This would create capacity to produce future B-21 aviators. As the B-21 aircraft are delivered, the first units to transition should be the squadrons located at Barksdale AFB. After the B-21s have been nuclear certified, then the remaining two units at Minot AFB should transition to the B-21.

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14. ABSTRACT

The 21st century adversary is presenting challenges to the United States unlike anything the U.S. has previously encountered. Present day adversaries are challenging the ability of the U.S. to project airpower. Rapid growth in technology has allowed U.S. adversaries to develop robust air defense systems, creating contested areas that limit the ability of the United States to gain and maintain air superiority. These new defenses have created a difficult tactical problem for the both the U.S. conventional and strategic nuclear forces to solve. Not only does the bomber force have to contend with robust advanced integrated defenses, the fleet's age is becoming a concern. The United States Air Force currently has 158 bombers in its inventory. Currently, both the B-1B and the B-52H will remain in service until 2045. Age and threat capabilities are driving the Department of Defense to pursue a replacement for the B-1Bs and B-52Hs. The goal of this research is to analyze the acquisition of 100 B-21 stealth bombers and determine the right size and composition of the U.S. bomber force and determine the impact the acquisition of a new stealth bomber will have on future nuclear arms treaties.

15. SUBJECT TERMS

B-21, Deterrence, Bomber Force

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